REMARKS

The present amendment adds the required reference to a parent application and places the claims in form for allowance. Claims 1 and 7 are amended to correct typographical errors and to indicate that the reaction in the present process is carried out at at a temperature of at least 125°C. Support for the amendments can be found at page 13, lines 1-5 of the specification. Claims 4-6 and 10-12 are amended to include reference numbers.

The invention as set forth in the present claims is directed to a process for producing uretdione group-containing polyaddition products, which are solid below 40°C and liquid above 125°C. The method includes reacting components that include A) through D) in a static mixer at a temperature of at least 125°C at an equivalent ratio of isocyanate groups to isocyanate-reactive groups of 1.8:1 to 0.6:1, where A) through D) include:

A) a uretdione group-containing polyisocyanate with an average isocyanate functionality of at least 2.0, and

B) up to 70 wt.%, based on the total weight of components A) and B), of a diisocyanate other than A), with

C) a polyol having a number average molecular weight of 62 - 2000 and an average functionality of at least 2.0, and

D) up to 40 wt.%, based on the total weight of components C) and D), of a monofunctional isocyanate-reactive compound.

In the parent application, U.S. Patents No. 5,356,945 to Werner et al. (hereinafter "Werner") was cited as allegedly rendering the claimed invention obvious under 35 U.S.C. § 103(a).

Werner discloses polyurethanes with softening temperatures above 80°C, which are NCO-free. The polyurethanes are made by reacting at least components I) through IV at temperatures that do not exceed 110° to 120°C (col. 8, lines 19-38). The components are:

I) one or more organic diisocyanates of which at least a proportion is symmetric,

II) one or more essentially linear polyhydroxyl compounds having molecular weights of between 400 and 6000 and glass transition temperatures below 0°C,

III) an organic compound having at least a proportion of masked NCO groups, and

IV) one or more diols having molecular weights of 60 to 600, where the ratio of the molecular weight of components II) to the molecular weight of component IV) is at least 3:1.

Additionally, Werner describes the solvent-free production of essentially linear thermoplastic polyurethanes (TPU's) which contain blocked isocyanate groups, in the form of uretdione groups for example. The reaction of the starting components can take place either in a "one-shot" process or in several stages via separately produced NCO or OH prepolymers. The mixing of the starting components can take place in any types of stirring machine, such as for example in extruders, kneaders or static mixers. The homogenized reaction mixture is then poured into a receiving vessel ("in blocks"), in which the actual exothermic reaction (referred to as the "after-reaction") takes place (see col. 8, lines 19-23).

In order to avoid back-cleavage of the (internal) masked isocyanate groups a maximum temperature of 110°-120°C must not be exceeded during the entire synthesis process, i.e. either during the mixing or the after-reaction process (col. 7, lines 63-67 and column 8, lines 34-37). In fact Claim 1 requires that the reaction be conducted at a temperature below the unmasking temperature of the masked NCO groups (element a) of Claim 1). At these low temperatures the urethanization proceeds correspondingly slowly: Examples 1 and 2 of Werner describe after-reaction times of 16 hours at 100°C. When finally completely, the reacted TPU's have melting points preferably in the range from 150-220°C (col. 7, lines 29-32, and example 2 - product melting point: 165°C). Thus, the mixture can no longer be stirred during the after-reaction in the receiving vessel. The discharge of the reaction mixture into the corresponding receiving vessels in which the main part of the reaction takes place over a period of hours of heating, followed by mechanical comminution of the resulting solid product (presumably using a sledge hammer) is not a process which can be carried out on an industrial scale.

Additionally, in the present invention, the critical dissociation temperature of 110°C for uretdione structures is specifically referred to (page 1, lines 28-30). The significance of this temperature as a limiting factor for industrial-scale production of uretdione powder coating crosslinking agents is discussed in detail in the

specification at page 2, line 4 to page 3, line 23. The technical solution to this problem in the present invention is completely different from the process of Werner.

Whereas the stirring machines described by Werner, for example static mixers, are used solely for mixing the reactants and the actual reaction takes place predominately at a temperature below the product melting point without any further stirring, In the present invention, the starting components are reacted with each other in a static mixer that includes at least two zones at temperatures of at least 125°C, in order to retain the flowability of the product melt (page 13, lines 1-3). For example, in Example 1 the product discharge temperature from the static mixer is 140°C (page 16, lines 2-5), which is well within the back-cleavage range of the uretdione groups. Due to the high reaction temperature, no after-reaction is necessary after the discharge from the static mixer despite the short reaction time. The product leaves the mixer in a completely reacted form and can then be rapidly cooled and packaged. The process is therefore suitable for industrial-scale production.

As Werner does not disclose or in any way suggest, and in fact teaches away from the reaction temperature in the presently claimed invention, it cannot render the claims obvious.

As such the claims are novel and non-obvious over Werner.

Entry of the amendment and early allowance of Claims 1-12 are requested.

Respectfully submitted,

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